



US006819630B1

(12) **United States Patent**
Blackmon et al.

(10) **Patent No.:** **US 6,819,630 B1**
(45) **Date of Patent:** **Nov. 16, 2004**

(54) **ITERATIVE DECISION FEEDBACK
ADAPTIVE EQUALIZER**

(75) Inventors: **Fletcher A. Blackmon**, Forestdale, MA (US); **Mohanadreza M. Hagh**, Belmont, MA (US); **John Proakis**, Andover, MA (US); **Masoud Salehi**, Westwood, MA (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/666,829**

(22) Filed: **Sep. 18, 2003**

Related U.S. Application Data

(60) Provisional application No. 60/412,432, filed on Sep. 20, 2002.

(51) **Int. Cl.**⁷ **H04B 11/00**

(52) **U.S. Cl.** **367/134; 375/233**

(58) **Field of Search** 367/134; 375/218, 375/341, 233, 240.07; 340/850

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,301,167 A * 4/1994 Proakis et al. 367/134
5,559,757 A * 9/1996 Catipovic et al. 367/134
5,844,951 A * 12/1998 Proakis et al. 375/233
6,295,312 B1 * 9/2001 Jarvis 367/134

* cited by examiner

Primary Examiner—Ian J. Lobo

(74) *Attorney, Agent, or Firm*—James M. Kasischke; Michael F. Oglo; Jean-Paul A. Nasser

(57) **ABSTRACT**

The present invention provides a receiver for underwater acoustic telemetry which combines a decision feedback adaptive equalizer structure with a modified turbo-equalizer structure. The modified turbo-equalizer structure is of significantly reduced complexity because the decision feedback adaptive equalizer structure is operable to process a plurality of data channels to provide a single symbol data output stream for application to the input of the modified turbo-equalizer which uses a decision feedback equalized, interleaver, deinterleaver and a decoder. Either a hard viterbi decoder for single iteration processing or a soft in/soft out decoder such as a MAP decoder for multiple iteration can be used. The iteration provide improved performance compared to a normal DFE and lower complexity compared to the traditional turbo-equalizer.

20 Claims, 4 Drawing Sheets

